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following chemicals and conditions in sea-water: acids, alkalis, hypertonicity, hypotonicity, ether, greatly diminished oxygen, potassium-cyanide, heat, cold, induction shocks and mechanical agitation. In many cases the eggs segmented while they remained in the artificial solution. They would not segment in sea-water charged with carbon dioxide unless most of the gas were allowed to leave the sea-water. They segmented in weak alkalis, hypertonic sea-water, diminished oxygen, KCN and cold.

From the above we may conclude that the various parthenogenetic agents could not have a similar chemical action and must have some common physico-chemical action, most probably changing the permeability of the plasma membrane, thus allowing the escape of carbon dioxide (as suggested by Lillie). The fact that eggs will not segment in concentrated carbon-dioxide demonstrates the last point. Lyon showed that the escape of carbon-dioxide from sea-urchin eggs varied rhythmically during cleavage, which suggests that a period of increased permeability is necessary for each cleavage. The stimulus to parthenogenetic development need only be applied once and the egg becomes automatic like any other cell.

The question arises whether these agents have any additional effect besides changing the permeability of the membrane. When the membrane becomes permeable some of the reagents must enter the cell. Probably this is the reason that some reagents start development that continues indefinitely, whereas after others development soon ceases (the eggs being injured by the reagent). Some chemicals may cause an irreversible permeability that does not initiate segmentation but causes death, but these will not be considered. It seemed to me that if the reagents caused a simple physical change, one could be made to act as quickly as another by finding the proper concentration, and this I tried to do. Fifteen seconds' exposure was sufficient with acetic acid while about seventeen hours was necessary with potassium cyanide. It is evident that the actions of the two are different. Probably the KCN slowly enters the egg while the membrane is relatively impermeable and by re-

tarding certain enzyme actions brings about increased permeability of the membrane. Or the KCN may make the membrane permeable immediately and then enter the egg, retarding the production of carbon-dioxide and thus necessitating a longer period of permeability.

Since the egg becomes automatic after one of a number of stimuli the question arises why it did not remain automatic like every other cell in growing regions of the mother. In studying the cell lineage of parasitic Copepods I found that the germ cells could first be distinguished from the soma cells by their slow rate of division. In the thirty-two cell stage, one cell is the primary germ cell and it does not divide as soon as the other cells do, but grows larger than they do. Probably its failure to become sufficiently permeable to divide as soon as the others allows it to grow larger and become the germ cell. This may be true of all its progeny and in the final generation, the primary oocytes, enormous growth takes place and division is impossible without a special stimulus. The plasma membrane may not be sufficiently permeable for cell division and yet allow the passage of nourishment. Perhaps fats and lecithin may enter the cell by dissolving in the lipoids of the membrane.

To sum up, we may conclude that all agents initiating parthenogenetic development in the egg of *Arbacia* cause increased permeability of the plasma membrane, but some agents act differently from others, either by having an indirect action or by producing additional effects.

J. F. McCLENDON

WOODS HOLE, MASS.,
Aug. 31, 1909

SOCIETIES AND ACADEMIES

AMERICAN MATHEMATICAL SOCIETY

THE sixteenth summer meeting and sixth colloquium of the society were held at Princeton University during the week September 13 to 18, 1909. The four sessions of the summer meeting proper occupied the first two days. Thirty-nine members were in attendance. At the opening session Professor Fine presided, being relieved at the later sessions by Professor Morley and Vice-presidents Kasner and Van Vleck. The following new

members were elected: Dr. L. S. Dederick, Princeton University; Dr. G. E. Wahlin, University of Illinois; Mr. E. E. Whitford, College of the City of New York. Eleven applications for membership were received.

It was decided to hold the annual meeting with that of the American Association at Boston. A grant of 5,000 francs was made from the treasury of the society in support of the proposed publication of the works of Euler. A committee was appointed to prepare suitable resolutions on the death of ex-President Simon Newcomb.

On Tuesday the members were conducted through the grounds and buildings of the university. Tuesday evening was marked by a reception at the house of Professor Fine.

The following papers were read at the summer meeting:

L. P. Eisenhart: "Congruences of the elliptic type."

Dunham Jackson: "Resolution into involutory substitutions of the transformation of a bilinear form into itself."

F. W. Reed: "On singular points in the approximate development of the perturbative function."

Virgil Snyder: "Surfaces invariant under infinite discontinuous birational groups defined by line congruences."

Joseph Lipke: "Natural families of curves in a general curved space." Preliminary communication.

A. S. Hawkesworth: "A new theorem in conics."

Anna J. Pell: "Applications of biorthogonal systems to integral equations."

G. C. Evans: "The integral equation of the second kind, of Volterra, with singular kernel."

Edward Kasner: "Triply orthogonal systems of surfaces."

Edward Kasner: "Natural families and Thomson's theorem."

G. A. Miller: "The groups which may be generated by two operators s_1, s_2 satisfying the equation $(s_1 s_2)^\alpha = (s_2 s_1)^\beta$, α and β being relatively prime."

F. R. Sharpe: "Integral equations with variable limits, with an application to the problem of age distribution."

R. D. Carmichael: "Note on a new number theory function."

T. E. McKinney: "On a criterion for λ -developments in the theory of equivalence."

G. G. Chambers: "Groups of isomorphisms of the abstract groups of order $p^2 q$."

W. R. Longley: "Note on some periodic orbits with more than one axis of symmetry."

W. H. Bussey: "Tables of Galois fields of order less than 1,000."

W. B. Ford: "On the relation between the sum formulas of Hölder and Cesàro."

Oswald Veblen: "Products of pairs of involutive projectivities."

G. F. Gundelfinger: "On the geometry of line elements in the plane with reference to osculating vertical parabolas and circles."

P. F. Smith: "Theorems in the geometry of surface elements in space."

R. G. D. Richardson and W. A. Hurwitz: "Note on determinants whose terms are certain integrals."

R. G. D. Richardson: "The Jacobi criterion in the calculus of variations and the oscillation of solutions of linear differential equations of the second order."

I. J. Schwatt: "Methods for the summation of infinite series."

A. B. Coble: "Cubic space curves that meet the Hessian of a cubic surface in six pairs of corresponding points."

G. D. Birkhoff: "On the theory of stability."

H. W. Reddick: "Geometric properties of a system of tautochrones."

W. B. Carver: "The poles of finite groups of fractional linear substitutions in the complex plane."

L. S. Dederick: "The solution of the equation in two real variables at a point where both the partial derivatives vanish."

H. T. Burgess: "On point-circle correlations in the plane."

H. B. Newson: "A general theory of linear groups."

A. R. Schweitzer: "A formal extension of Bolzano's series."

The colloquium opened on Wednesday morning. Two courses of four lectures each were given by Professor G. A. Bliss, on "Fundamental existence theorems," and Professor Edward Kasner, on "Geometric aspects of dynamics." Thursday afternoon was devoted to an excursion to Washington's headquarters at Rocky Hill.

The San Francisco section of the society held its regular meeting at the University of California on September 25. The next meeting of the society will be held at Columbia University on October 30.

F. N. COLE,
Secretary